

CLAIMS

What is claimed is:

1. An electrode assembly divided into a plurality of segments which are each separated by a fold, to, in turn, facilitate a fan-fold orientation, comprising:

- a separator having an anode side and a cathode side;

- an anode current collector and a cathode current collector, wherein an anode active material is associated with the anode current collector, and wherein, a cathode active material is associated with the cathode current collector, and wherein, the anode active material is associated with at least a portion of the anode side, and wherein, the cathode active material is associated with at least a portion of the cathode side; and

wherein the portions of the separator corresponding to at least one of the folds are substantially free of at least one of the anode active material and cathode active material resulting in a gap between the respective side of the separator and the respective current collector.

2. The electrode assembly of claim 1 wherein the portions of the separator corresponding to at least one of the folds are substantially free of each of the anode active material and the cathode active material resulting in a gap between each side of the separator and the respective current collector.

3. The electrode assembly of claim 1 wherein the portions of the separator corresponding to each of the folds are substantially free of each of the anode active material and cathode active material resulting in a gap between each side of the separator and the respective current collector proximate each of the folds.

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4. The electrode assembly of claim 1 wherein the separator includes an upper edge and a lower edge, at least a portion of the upper edge of one of the anode side and the cathode side of the separator and at least a portion of the lower edge of one of the anode side and the cathode side of the separator being substantially free of at least one of the respective anode and cathode active material and at least one of the respective anode and cathode current collector.

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5. The electrode assembly of claim 4 wherein the upper and the lower edge of the cathode side of the separator being substantially free of cathode active material and the cathode current collector.

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6. The electrode assembly of claim 5 wherein the cathode active material and the cathode current collector are coextant and are substantially centered along the separator.

7. The electrode assembly of Claim 1 wherein the anode current collector is coextant with the anode active material.

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8. The electrode assembly of claim 1 wherein the cathode current collector is coextant with the cathode active material.

9. The electrode assembly of claim 1 wherein at least one of a portion of the anode active material and a portion of the cathode active material is associated with at least one of a portion of the anode side and a portion of the cathode side respectively via an adhesive.

5 10. The electrode assembly of claim 1 wherein at least one of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

10 11. The electrode assembly of claim 1 wherein each of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

15 12. The electrode assembly of claim 10 wherein each of the anode current collector and the cathode current collector each include at least one slit corresponding to each of the folds of the electrode assembly.

13. An electrode assembly divided into a plurality of segments which are each separated by a fold, to, in turn, facilitate a fan-fold orientation, comprising:

- a separator having an anode side and a cathode side;
- 20 - an anode current collector and a cathode current collector, wherein an anode active material is associated with the anode current collector, and wherein, a cathode active material is associated with the cathode current collector, and wherein, the anode active material is associated with at least a portion of the anode side, and wherein, the cathode active material is

associated with at least a portion of the cathode side; and

wherein the separator includes an upper edge and a lower edge, at least a portion of the upper edge of one of the anode side and the cathode side of the separator and at least a portion of the lower edge of one of the anode side and the cathode side of the separator being substantially free of the respective anode or cathode active material and the respective anode or cathode current collector.

14. The electrode assembly of claim 13 wherein the upper and the lower edge of the cathode side of the separator being substantially free of cathode active material and the cathode current collector.

15. The electrode assembly of claim 14 wherein the cathode active material and the cathode current collector are coextant and are substantially centered along the separator.

16. The electrode assembly of claim 13 wherein the portions of the separator corresponding to at least one of the folds are substantially free of each of the anode active material and the cathode active material resulting in a gap between each side of the separator and the respective current collector.

17. The electrode assembly of claim 13 wherein the portions of the separator corresponding to each of the folds are substantially free of each of the anode active material and cathode active material resulting in a gap between each side of the separator and the respective current collector proximate each of the folds.

18. The electrode assembly of Claim 13 wherein the anode current collector is coextent with the anode active material.

5 19. The electrode assembly of claim 13 wherein the cathode current collector is coextent with the cathode active material.

10 20. The electrode assembly of claim 13 wherein at least one of a portion of the anode active material and a portion of the cathode active material is associated with at least one of a portion of the anode side and a portion of the cathode side respectively via an adhesive.

21. The electrode assembly of claim 13 wherein the at least one of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

15 22. The electrode assembly of claim 13 wherein each of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

20 23. The electrode assembly of claim 13 wherein each of the anode current collector and the cathode current collector each include at least one slit corresponding to each of the folds of the electrode assembly.

24. An electrode assembly divided into a plurality of segments which are each separated by a fold, to, in turn, facilitate a fan-fold orientation, comprising:

- a separator having an anode side and a cathode side;

- an anode current collector and a cathode current collector, wherein an anode active material is associated with the anode current collector, and wherein, a cathode active material is associated with the cathode current collector, and wherein, the anode active material is associated with at least a portion of the anode side, and wherein, the cathode active material is associated with at least a portion of the cathode side; and

wherein at least one of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

25. The electrode assembly of claim 24 wherein each of the anode current collector and the cathode current collector includes at least one slit corresponding to at least one fold of the electrode assembly.

26. The electrode assembly of claim 24 wherein each of the anode current collector and the cathode current collector each include at least one slit corresponding to each of the folds of the electrode assembly.

27. The electrode assembly of claim 24 wherein the portions of the separator corresponding to at least one of the folds are substantially free of each of the anode active material and the cathode active material resulting in a gap between each side of the separator and the respective current collector.

28. The electrode assembly of claim 24 wherein the portions of the separator corresponding to each of the folds are substantially free of each of the anode active material and cathode active material resulting in a gap between each side of the separator and the respective current collector proximate each of the folds.

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29. The electrode assembly of Claim 24 wherein the anode current collector is coextant with the anode active material.

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30. The electrode assembly of claim 24 wherein the cathode current collector is coextant with the cathode active material.

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31. The electrode assembly of claim 24 wherein at least one of a portion of the anode active material and a portion of the cathode active material is associated with at least one of a portion of the anode side and a portion of the cathode side respectively via an adhesive.

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32. A method of manufacturing an electrode assembly comprising the steps of:

- providing a separator having an anode side and a cathode side;
- providing a first active material comprising one of an anode active material and a cathode active material;
- providing an adhesive on a top surface of the separator on at least one of the anode side and cathode side; and
- joining the first active material with the corresponding side of the separator.

33. The method according to claim 32 wherein the step of providing a first active material comprises the steps of:

- providing an anode current collector; and
- applying the anode active material to one side of the anode current collector.

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34. The method according to claim 32 wherein the step of providing a first active material comprises the steps of:

- providing an cathode current collector; and
- applying the cathode active material to one side of the cathode current collector.

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35. The method of claim 32 wherein at least one of a portion of the anode active material and a portion of the cathode active material is associated with at least one of a portion of the anode side and a portion of the cathode side respectively via an adhesive.

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36. The method according to claim 32 wherein the step of joining further comprises the step of:

- pressing the first active material against the separator.

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37. The method according to claim 32 wherein the step of joining further comprises the step of:

- heating the first active material and the separator..

38. The method according to claim 37, wherein the steps of pressing the first active material against the separator and heating the first active material and the separator are conducted simultaneously.

5 39. The method according to claim 32 further comprising the step of:

- folding the joined first active material and separator into a fan-fold orientation.

40. A method of manufacturing an electrode assembly comprising the steps of:

- providing a first current collector having a at least one fold region, the first current

10 collector comprising one of an anode current collector and a cathode current collector;

- applying a first active material to the first current collector, the first active material corresponding to the respective anode active material and cathode active material;

- removing the first active material from the first current collector proximate the at least one fold region;

15 - providing a separator having a fold regions corresponding to each of the at least one fold region of the first current collector; and

- joining the first active material to the separator to, in turn, associate the fold regions of each of the first current collector and separator.

20 41. The method of claim 40 wherein at least one of a portion of the anode active material and a portion of the cathode active material is associated with at least one of a portion of the anode side and a portion of the cathode side respectively via an adhesive.

42. The method of claim 40 further comprising the step of:

- forming slits in at least one of the fold regions of the first current collector.

43. The method of claim 40 wherein the step of forming slits in at least one of the fold

5 regions of the first current collector is conducted via laser.

44. The method of claim 40 further comprising the steps of:

- providing a second current collector having at least one fold region, the second current collector being the other of a anode current collector and a cathode current collector;

10 - applying a second active material to the second current collector, the second active material being the other of an anode current collector and a cathode current collector;

- removing the second active material from the second current collector proximate the at least one fold region; and

15 - joining the second active material to the opposite side of the separator to which the first active material is joined, in turn, associate the fold regions of each of the second current collector and separator.

45. The method of claim 40 wherein the step of removing comprises at least one of the steps of:

20 - abrading the surface of the active material;

- removing selected portions of the surface of the active material via laser;

and

- applying a solvent to the portion of the active material.

46. A method of manufacturing an electrode assembly comprising the steps of:

- providing a separator having an anode side and a cathode side;
- providing a first active material comprising one of an anode active material and a cathode active material;

5 - applying a solvent to one of the first active material and the corresponding side of the separator;

 - placing the first active material onto the corresponding side of the separator, prior to evaporation of the solvent; and

- joining the first active material with the corresponding side of the separator.

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47. The method of claim 46 further comprising the steps of:

 - providing a second active material comprising the other of an anode active material and a cathode active material;

15 - applying a solvent to one of the second active material and the corresponding side of the separator;

 - placing the second active material onto the corresponding side of the separator, prior to evaporation of the solvent; and

- joining the second active material with the corresponding side of the separator.

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